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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Andrea Steinmeyer et al.

Group Art Unit: 1616

Serial No.: 09/509,934

Examiner: S. Qazi

Filed: May 3, 2000

For: NEW VITAMIN D DERIVATIVES WITH CYCLOPROPYL RINGS IN THE SIDE CHAINS, PROCESS AND INTERMEDIATE PRODUCTS FOR THEIR PRODUCTION AND THEIR USE FOR THE PRODUCTION OF PHARMACEUTICAL AGENTS

APPEAL BRIEF

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Further to the Notice of Appeal filed July 18, 2002, herewith are three copies of Appellants' Brief on Appeal. A check for the statutory fee of \$310.00 fee for filing an Appeal Brief is enclosed. This is an appeal from the decision of the Examiner finally rejecting claims 1-3, 5, 6, 8-11, and 14-30 of the above-identified application.

(1) REAL PARTY IN INTEREST

The real party in interest in the present application is Schering Akteingesellschaft, to whom the present application is assigned, the Assignment being recorded May 3, 2000, at Reel 010787, Frame 0974.

(2) RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences.

(3) STATUS OF THE CLAIMS

During the prosecution of the instant application, claims 1-30 were presented for examination. Claims 4 and 7 were cancelled in the Amendment filed March 12, 2001.

Claims 1-3, 5, 6, 8-14-30 remain pending. Of these pending claims, claims 12 and 13 have been withdrawn from consideration as being drawn to a nonelected invention and claims 1-3, 5, 6, 8-11, and 14-30 are rejected.

(4) STATUS OF AMENDMENTS AFTER FINAL

No amendments have been submitted in the instant application following the Final Rejection in the Office Action of January 18, 2002 (Paper No. 13). A Reply under 37 CFR §1.116 was filed May 20, 2002, but was held not to place the application in condition for allowance (See Advisory Action of June 10, 2002).

(5) SUMMARY OF THE INVENTION

The invention relates to vitamin D derivatives which exhibit a cyclopropyl ring in their side chains. See, for example, Formula I at pages 4-5 of the specification. These new vitamin D derivatives are directed to solving the need for such compounds exhibiting an advantageous spectrum of action while also being better suited for systemic administration due to higher metabolic stability. See, e.g., page 2, lines 3-7 of Appellants' specification. In addition, the invention relates to a process for synthesizing such vitamin D derivatives as well as methods of treatments involving the administration of such vitamin D derivatives. See, e.g., claims 6, 8-11 and 15-18 in the Appendix.

(6) ISSUES

The issues outstanding in this application are:

(1) the rejection under the judicially created doctrine of obviousness double patenting in view of Steinmeyer et al. (US 5,585,368), i.e., whether claims 1-3, 5, 6, 8-11, and 14-30 are render obvious by claims 1-15 of Steinmeyer et al. (US 5,585,368);

(2) the rejection under the judicially created doctrine of obviousness double patenting in view of Steinmeyer et al. (US 5,700,791), i.e., whether claims 1-3, 5, 6, 8-11, and 14-30 are render obvious by claims 1-9 of Steinmeyer et al. (US 5,700,791);and

(3) the rejection under 35 U.S.C. §103, i.e., whether claims 1-3, 5, 6, 8-11, and 14-30 are render obvious by Kirsh et al. (WO 97/00242).

(7) GROUPING OF THE CLAIMS

For the purpose of this appeal, 14, 20-22 and 29 stand or fall with the rejections of claim 1. Claims 2, 3, 5, 6, 8-11, 15-19, 23-28, and 30 do not stand or fall with the rejections of claim 1 and are separately argued below.

(8) APPELLANTS' ARGUMENTS

A. Obviousness-Type Double Patenting Rejections

Claims 1-3, 5, 6, 8-11, and 14-30 are rejected on grounds of obviousness-type double patenting in view of claims 1-15 of Steinmeyer et al. (US 5,585,368) and claims 1-9 of Steinmeyer et al. (US 5,700,791). US '791 is a Divisional of US '368.

The rejection fails to state any reasons as to why the claimed subject matter is considered to be obvious in view of the claims of US '368 or US '791. The obviousness double patenting rejection was first presented in the Office Action of June 4, 2001 (Paper No. 10). In the rejection, it is merely asserted that the instantly claimed subject matter is "fully disclosed in the patent and is covered by the patent." Thereafter, it is stated that the claimed invention "is drawn to the vitamin D derivatives which are considered obvious over the claims of the prior U.S. patent issued to the same inventor and same assignee."

These statements merely present an unsupported conclusion of obviousness. No rationale is provided as to how the claims of US '368 or the claims of US '791 render obvious appellants' claims.

Appellants rebutted these rejections in a Reply filed December 4, 2001. In the Office Action of January 18, 2002, the Examiner responded to appellants' prior arguments concerning the double-patenting and §103 rejections as follows:

Applicant's arguments regarding the double patenting and 103 rejections were fully considered but are not found persuasive. Applicant argues that prior art teaches the cyclopropyl group at 24 position whereas instant claims are claiming at 25-position. Examiner respectfully disagree because instant invention is claiming Q which can be alkyl which can have OH at any position which in turn

can be etherified or esterified, keto groups, amino groups or halogens (see definition of Q in claim 1).

These comments do not relate to the obviousness-type double patenting rejections or appellants' rebuttal thereof. Instead, these comments relate to the §103 rejection.

With respect to any double patenting rejection, it is the claims in the reference which are to be relied on, not the disclosure in the specification. Nothing within the claims of US '368 and/or US '791 provides any motivation that would lead one to a compound in accordance with appellants' claim 1 or claim 30. No rationale is presented in the rejection as to why the claimed compounds are considered obvious in view of the **claims** of US '368 and US '791. Moreover, nothing within the rejection speaks to the requisite motivation that would lead one of ordinary skill in the art, based on the claims of US '368 and/or US '791, to a compound in accordance with the claimed invention. For these reasons alone, the obviousness-type double patenting rejection should be withdrawn.

In claim 1 of US '368 and claim 1 of US '791, group Z is defined as H, OH or alkanoyloxy group having 1-9 carbon atoms. Group L is defined as either $-\text{CH}_2\text{-A-B-}$ or $-\text{D-CHE-CHF-G-}$. A is O and B is $-(\text{CH}_2)_n-$ with n being 1-6. D is a direct bond, a methylene bridge or a 1,2-ethenediyl bridge (i.e., an E-double bond) between carbon atoms 20 and 22; E and F are each hydrogen atom or together form a second bond (E-double bond) bond; and G is a direct bond or is $-(\text{CH}_2)_n-$ with n being 1-6 and in which a $-\text{CH}_2-$ group can be replaced by a oxygen atom. With regards to the carbon atom numbering, see, e.g., column 4 of US '398.

Thus, in the claims of both US '368 and US '791, the structure from the C-20 atom is $-\text{C}^{20}\text{R}_1\text{R}_2\text{-CH}_2\text{-O-(CH}_2\text{)}_{1-6}\text{-CR}_3\text{R}_3\text{Z}$ or $-\text{C}^{20}\text{R}_1\text{R}_2\text{-D-CHE-CHF-(CH}_2\text{)}_{0-6}\text{-CR}_3\text{R}_3\text{Z}$. On the other hand, in appellants' claim 1 the structure from the C-20 atom is $-\text{C}^{20}\text{R}_3\text{R}_4\text{-CHV-CHW-Q-cyclopropyl-Z}$ in which Q is defined as a carbon unit having up to 10 carbon atoms which have can have alpha or beta hydroxy groups, amino groups, and/or halogen atoms and wherein the mentioned hydroxy groups can be esterified or etherified, but is not $-\text{CHOH-}$. In claim 30, the structure from the C-20 atom is $-\text{C}^{20}\text{R}_3\text{R}_4\text{-CHV-CHW-Q-cyclopropyl-Z}$ in which Q is $-\text{CH}_2-$ or $-\text{CH}_2\text{-CH}_2-$. In both of these structures, V and W are an E-double bond

or V is OH and W is H.

Nothing in the rejection, or the claims of US '368 and US '791, suggests modifying either $-\text{CH}_2\text{-A-B-}$ or $-\text{D-CHE-CHF-G-}$ so as to arrive at structure in accordance with that possessed by compounds of appellants' claimed invention. For example, nothing suggests replacing the $-\text{CH}_2\text{-O-}$ of $-\text{CH}_2\text{-A-B-}$ with $-\text{CH=CH-}$ or $-\text{CHOH-CH}_2\text{-}$. Similarly, nothing suggest selecting D to be a single bond while CHE-CHF is a double bond and $\text{CR}_3\text{R}_3\text{Z}$ is cyclopropyl-Z. None of the claims require D to be a single bond. Also, none of the claims require CHE-CHF to be a double bond. Conversely, several claims require the compounds to possess the structure $-\text{CH}_2\text{-A-B-}$, rather than the structure $-\text{D-CHE-CHF-G-}$. See claims 8, 11, 12, and 13 of US '368 and claims 8 and 9 of US '791.

While it is the claims rather than the specification that are relevant in double-patenting rejections, it is noted that the specification does not provide any guideposts that lead to a structure in which D is a single bond while CHE-CHF is a double bond and $\text{CR}_3\text{R}_3\text{Z}$ is cyclopropyl-Z. None of the disclosed compounds or subgenera require D to be a single bond. Also, none of the disclosed compounds or subgenera require CHE-CHF to be a double bond. See the side chains listed in the text bridging columns 1-2 and 3-4. See also the specific compounds listed at columns 3-4 and 6 and in the Examples.

Claims 2 and 3

These claims recite specific structures for Q (alkylene of 1-2 C atoms and $-\text{CH(OH)-CH}_2\text{-CH}_2\text{-}$) and Z (straight chain 1-oxoalkyl). The claims of US '368 and US '791 define their Z group as H, OH, or alkanoyloxy of 1-9 C atoms. Nothing within the claims suggests modifying the Z group so as to be a 1-oxoalkyl group. Further, there is no suggestion in the claims that leads one to select a structure for the group L which corresponds to the resultant structure $-\text{CHV-CHW-Q-}$ of appellants' claims 2 and 3, let alone combine such a structure with a Z group which is a 1-oxoalkyl group.

Claims 5 and 19

These claims recite specific compounds. The rejections are devoid of any suggestion or motivation that would lead one of ordinary skill in the art from the claims of US '398 or US '791 to the specific compounds recited in these claims.

Claims 6, 8-11, and 15-18

Appellants' claim 6 is a synthesis claim. Claims 8-11 and 15-18 recite methods of treatment. The claims of US '398 or US '791 are drawn to compounds and compositions containing same. Nothing within the claims of US '398 or US '791 provides any suggestion of any synthesis steps or treatments, let alone those recited in appellants' claims 6, 8-11, and 15-18.

Claims 23-28 and 30

These claims recite particular structures for group Q or group Z. The claims of US '398 and US '791 do not lead one to a group L or group Z which corresponds to the resultant structure of appellants' -CHV-CHW-Q- or group Z, respectively, as recited in these claims. See, e.g., the arguments presented above concerning claims 1 and 2-3.

Claim 27

This claim recites that the structure -CHV-CHW- in appellants' formula I is -CHOH-CH₂-. The claims of US '398 and US '791 do not suggest such a structure. Compare the definitions of groups A, B, D, E, F, and G in the claims of US '398 and US '791.

In view of the above remarks, it is respectfully submitted that neither the claims of US '368 nor the claims of US '791 render obvious appellants' claimed invention. Reversal of both obviousness-type double patenting rejections is respectfully requested.

B. Rejection Under 35 U.S.C. §103 In View of Kirsch et al. (WO '242)

Claims 1-3, 5, 6, 8-11, and 14-30 are rejected as being obvious under 35 USC §103 in view of Kirsch et al (WO 97/00242). As WO '242 is not an English language document, appellants' suggest that the Board refer to either US 6,372,731, or its' continuation US 6,376,480. US '731 is the US national phase of WO '242.

In the rejection, reference is made to formula I at page 1 and Example XXXIV at page 36. Further, it is argued that WO '242 discloses 3-7-membered carbocyclic or heterocyclic ring groups at the C-25 position.

In formula I of WO '242, the C-24 position is substituted by Groups A and B. Groups A and B can together form a keto group. Alternatively, Group A can be OR' and B can be a hydrogen atom or B can be OR' and A can be a hydrogen atom. R' is a hydrogen atom, an alkanoyl group of up to 9 carbon atoms, or an aroyl group. Thus, in formula I of WO '242, the structure from the C-20 position is $-C^{20}R_3R_4-CH=CH-CO-C^{25}R_5R_6Z$ or $-C^{20}R_3R_4-CH=CH-CHOR'-C^{25}R_5R_6Z$. Group Z is defined broadly and can include carbocyclic and heterocyclic structures. See, e.g., column 1, lines 56-65 of US '731 and the disclosure bridging pages 1-2 of WO '242.

The structure(s) form by R_5 and R_6 are broader than 3-7 numbered carbocyclic ring groups mentioned in the rejection. These groups can each be H, Cl, F, trifluoromethyl, or straight-chain or branched-chain, saturated or unsaturated hydrocarbon radicals with up to 4 carbon atoms, in addition to forming 3-7 membered, saturated or unsaturated carbocyclic groups with the carbon atom at the 25 position.

On the other hand, as noted above, in appellants' claim 1 the structure from the C-20 atom is $-C^{20}R_3R_4-CHV-CHW-Q-cyclopropyl-Z$ in which Q is not $-CHOH-$ and in claim 30 it is $-C^{20}R_3R_4-CHV-CHW-Q-cyclopropyl-Z$ in which Q is $-CH_2-$ or $-CH_2-CH_2-$.

The Examiner argues that WO '242 is generic to the claimed invention. However, there is no rationale presented in the rejection as to what motivation would lead one to a compound in accordance with the appellants' claimed genus, either by selection or modification.

One of ordinary skill in the art presented with the disclosure of WO '242 and its broad genus of compound is not provided with sufficient motivation to modify the compounds disclosed therein in such a manner as to arrive at a compound in accordance with appellants' claims genus. The mere disclosure of a broad genus of compounds does not, in and of itself, establish obviousness with respect to each and every compound encompassed therein. See, for example, *In re Jones*, 21 USPQ 2d 1941 (Fed. Cir. 1991) and *In re Baird*, 29 USPQ 2d 1550 (Fed. Cir. 1994). Instead, the disclosure must provide some motivation which would lead one of ordinary skill in the art, without the benefit of hindsight, to modify the disclosed compounds in such a manner as to arrive at the claimed compound.

In this case, no such motivation is presented in WO '242 or is asserted in the rejection that would lead one of ordinary skill in the art to modify the C-25 cyclopropyl compounds disclosed in WO '242 in such a manner as to arrive at a compound in accordance with appellants' claimed genus. Merely asserting that a reference has a generic disclosure which overlaps a claim does not satisfy the requisite showing of motivation for obviousness as discussed by the Court in *Jones* and *Baird*.

Aside from formula I, the rejection also refers to the "example XXXIV" at page 36 of WO '242 (column 27 of US '731). The structure identified as XXXIV at page 36 is a formula directed to a genus of compounds which exhibit a structure from the C-20 position of -C²⁰HCH₃-CH=CH-CH(OR₁₁)-cyclopropyl-Z'. R₁₁ is an acid-labile protective group having a definition analogous to Y'₁ or Y'₂, or is tetrahydropyranyl, tetrahydrofuranyl, ethoxyethyl, methoxymethyl, or methoxyethoxymethyl. See the disclosure at the middle of page 27 WO '242 (column 19 of US '731). Y'₁ is a hydrogen atom or a protected hydroxy group and Y'₂ is a hydroxy protective group. The protective groups are said to preferably be alkyl-, aryl-, or mixed alkylaryl-substituted silyl groups. Examples of protective groups disclosed by WO '242 are TMS, TES, TBDMA, TBDPS, and TIPS. See the description of Y'₁ and Y'₂ at page 22 WO '242 immediately following formula II (column 15 of US '731). Z' is analogous to group Z of WO '242 or optionally exhibits protective group-carrying substituents. See the bottom of page 22 WO '242 (column 15 of US '731).

Here again, the mere disclosure of a broad genus of compounds does not, in and of itself, establish obviousness with respect to each and every compound encompassed therein. See *Jone* and *Baird*. The rejection is devoid of any indication as to what motivation would lead one of ordinary skill in the art from formula XXXIV to a compound of appellants' claimed invention. This is particularly the case for the formula XXXIV which is described in WO '242 as an **intermediate** within a synthesis process. See, e.g., pages 36 and 30 of WO '242 (columns 22 and 27 of US '731). There is no motivation to interrupt the synthesis process, isolate the intermediate, and modify its structure. See, e.g., *In re Lulu et al.*, 223 USPQ 1257 (Fed. Cir. 1984).

Claims 2 and 3

These claims recite specific structures for Q (alkylene of 1-2 C atoms and -CH(OH)-CH₂-CH₂-) and Z (straight chain 1-oxoalkyl). The rejection presents no rationale as to how WO '242 suggests selecting the Z group so as to be a 1-oxoalkyl group. Further, there is no suggestion in the claims that leads one to select a structure for the group -CH=CH-CAB- of formula I of WO '242 which corresponds to the resultant structure -CHV-CHW-Q- of appellants' claims 2 and 3, let alone combine such a structure with a Z group which is a 1-oxoalkyl group.

Claims 5 and 19

These claims recite specific compounds. The rejection is devoid of any suggestion or motivation that would lead one of ordinary skill in the art from the formula I or formula XXXIV of WO '242 to the specific compounds recited in these claims.

Claims 23-28 and 30

These claims recite particular structures for group Q or group Z. The disclosure of WO '242 does not lead one to a group -CH=CH-CAB- or group Z which corresponds to the resultant structure of appellants' -CHV-CHW-Q- or group Z, respectively, as recited in these claims. See, e.g., the arguments presented above concerning claims 1 and 2-3.

Claim 27

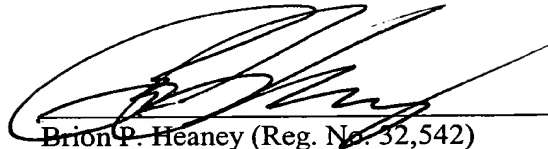
This claim recites that the structure -CHV-CHW- in appellants' formula I is -CHOH-CH₂-. The disclosure of WO '242 does not suggest such a structure. Compare formula I of WO '242.

In view of the above remarks, it is respectfully submitted that Kirsch et al. (WO '242) fails to provide sufficient motivation to render obvious appellants' claimed invention. Reversal of the rejection under 35 U.S.C. §103 is respectfully requested.

(9) Conclusion

In view of the arguments and authorities presented above, Appellants request that the Examiner's action in making and maintaining the Obviousness Double Patenting Rejections and the Rejection under 35 USC §103 be reversed and that the application be allowed.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Brion P. Heaney', is written over a horizontal line.

Brion P. Heaney (Reg. No. 32,542)

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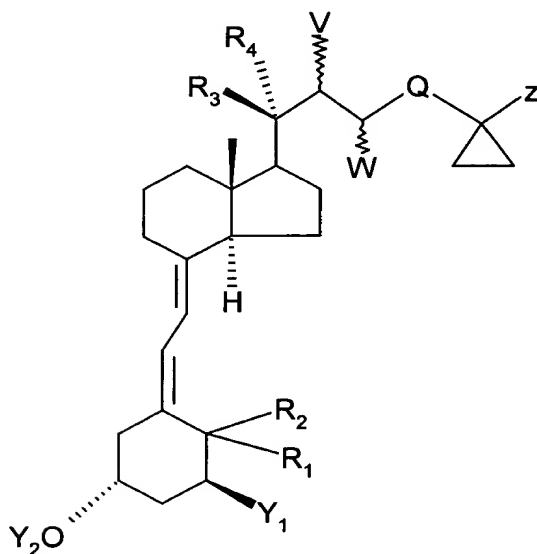
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Filed: September 18, 2002

APPENDIX
Copy of Appealed Claims

1. A vitamin D compound of formula I,



in which

Y_1 means a hydrogen atom, a hydroxyl group, a fluorine, chlorine or bromine atom or a group $-OCOR_8$, in which

R_8 is an aliphatic or aromatic radical with 1 to 12 C atoms,

Y_2 means a hydrogen atom or a group $-(CO)R_9$, in which

R_9 is an aliphatic or aromatic radical with 1 to 12 C atoms,

R_1 and R_2 each mean a hydrogen atom or together an exocyclic methylene group,

R_3 and R_4 , independently of one another, mean a hydrogen atom, a chlorine or fluorine atom, an alkyl group with 1 to 4 carbon atoms, or together form a methylene group or together with quaternary carbon atom 20 form a 3- to 7-membered, saturated or unsaturated carbocyclic ring,

V and W together mean an E-double bond or V means a hydroxyl group and W means a hydrogen atom,

- Q means a straight-chain or branched carbon unit with up to 10 carbon atoms, which at any position can have α - or β -hydroxyl groups, which in turn can be etherified or esterified, keto groups, amino groups or halogen atoms,
- Z means a straight-chain or branched-chain, saturated or unsaturated hydrocarbon radical with up to 12 carbon atoms, which at any positions can have keto groups, α - or β -hydroxyl groups, which in turn can be etherified or esterified, amino groups, chlorine, or bromine atoms
wherein Q is not -CHOH-.

2. A compound according to claim 1, wherein Q means an unsubstituted, unbranched alkylene unit with 1 or 2 carbon atoms, and Z means a straight-chain 1-oxoalkyl radical.

3. A compound according to claim 1, wherein Q means a -CH(OH)-CH₂-CH₂ radical, and Z means a straight-chain 1-oxoalkyl radical.

5. Vitamin D derivatives of general formula I according to claim 1, namely

(5Z,7E,22E)-(1S,3R)-25-Acetyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R)-25-(1-oxopropyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R)-25-(1-oxobutyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R)-25-(1-oxopentyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R)-25-(1-oxohexyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R)-25-(1-oxoheptyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R)-25-(1-oxooctyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R)-25-(1-oxononyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R)-25-(1-oxodecyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E)-(1S,3R,22S)-25-acetyl-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-acetyl-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxopropyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxopropyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxobutyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxobutyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxopentyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxopentyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxohexyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxohexyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxoheptyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxoheptyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxooctyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxooctyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-

1,3,22-triol,
 (5Z,7E)-(1S,3R,22S)-25-(1-oxononyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-
 1,3,22-triol,
 (5Z,7E)-(1S,3R,22R)-25-(1-oxononyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-
 1,3,22-triol,
 (5Z,7E)-(1S,3R,22S)-25-(1-oxodecyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-
 1,3,22-triol,
 (5Z,7E)-(1S,3R,22R)-25-(1-oxodecyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19)-triene-
 1,3,22-triol,
 (5Z,7E,22E)-(1S,3R)-25-acetyl-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19),22-
 tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R)-25-(1-oxopropyl)-26,27-cyclo-24a-homo-9,10-secocholesta-
 5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R)-25-(1-oxobutyl)-26,27-cyclo-24a-homo-9,10-secocholesta-
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 (5Z,7E,22E)-(1S,3R)-25-(1-oxoheptyl)-26,27-cyclo-24a-homo-9,10-secocholesta-
 5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R)-25-(1-oxooctyl)-26,27-cyclo-24a-homo-9,10-secocholesta-
 5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R)-25-(1-oxononyl)-26,27-cyclo-24a-homo-9,10-secocholesta-
 5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R)-25-(1-oxodecyl)-26,27-cyclo-24a-homo-9,10-secocholesta-
 5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E)-(1S,3R,22S)-25-acetyl-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-
 triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-acetyl-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxopropyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxopropyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxobutyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxobutyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxopentyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxopentyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxohexyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxohexyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxoheptyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxoheptyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol, (5Z,7E)-(1S,3R,22S)-25-(1-oxooctyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxooctyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxononyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxononyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22S)-25-(1-oxodecyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E)-(1S,3R,22R)-25-(1-oxodecyl)-26,27-cyclo-24a-homo-9,10-secocholesta-5,7,10(19)-triene-1,3,22-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-acetyl-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-acetyl-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-(1-oxopropyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-(1-oxopropyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-(1-oxobutyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-(1-oxobutyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-(1-oxopentyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-(1-oxopentyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-(1-oxohexyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-(1-oxohexyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-(1-oxoheptyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-(1-oxoheptyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-(1-oxooctyl)-26,27-cyclo-24a,24b-dihomo-9,10-

secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z,7E,22E)-(1S,3R,24S)-25-(1-oxooctyl)-26,27-cyclo-24a,24b-dihomo-9,10-
 secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z,7E,22E)-(1S,3R,24R)-25-(1-oxononyl)-26,27-cyclo-24a,24b-dihomo-9,10-
 secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z,7E,22E)-(1S,3R,24S)-25-(1-oxononyl)-26,27-cyclo-24a,24b-dihomo-9,10-
 secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z,7E,22E)-(1S,3R,24R)-25-(1-oxodecyl)-26,27-cyclo-24a,24b-dihomo-9,10-
 secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z,7E,22E)-(1S,3R,24S)-25-(1-oxodecyl)-26,27-cyclo-24a,24b-dihomo-9,10-
 secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z,7E,22E)-(1S,3R,24R)-25-acetyl-24-methoxy-26,27-cyclo-24a,24b-dihomo-9,10-
 secocholesta-5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R,24S)-25-acetyl-24-methoxy-26,27-cyclo-24a,24b-dihomo-9,10-
 secocholesta-5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R,24R)-24-methoxy-25-(1-oxopropyl)-26,27-cyclo-24a,24b-dihomo-
 9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R,24S)-24-methoxy-25-(1-oxopropyl)-26,27-cyclo-24a,24b-dihomo-
 9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R,24R)-24-methoxy-25-(1-oxobutyl)-26,27-cyclo-24a,24b-dihomo-
 9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R,24S)-24-methoxy-25-(1-oxobutyl)-26,27-cyclo-24a,24b-dihomo-
 9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R,24R)-24-methoxy-25-(1-oxopentyl)-26,27-cyclo-24a,24b-dihomo-
 9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R,24S)-24-methoxy-25-(1-oxopentyl)-26,27-cyclo-24a,24b-dihomo-
 9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,
 (5Z,7E,22E)-(1S,3R,24R)-24-methoxy-25-(1-oxohexyl)-26,27-cyclo-24a,24b-dihomo-
 9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24S)-24-methoxy-25-(1-oxohexyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24R)-24-methoxy-25-(1-oxoheptyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24S)-24-methoxy-25-(1-oxoheptyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24R)-24-methoxy-25-(1-oxooctyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24S)-24-methoxy-25-(1-oxooctyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24R)-24-methoxy-25-(1-oxononyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24S)-24-methoxy-25-(1-oxononyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24R)-24-methoxy-25-(1-oxodecyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24S)-24-methoxy-25-(1-oxodecyl)-26,27-cyclo-24a,24b-dihomo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-diol,

(5Z,7E,22E)-(1S,3R,24S)-25-methyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-methyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-ethyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-ethyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-propyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-propyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-butyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-

1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-butyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-

1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-pentyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-pentyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-hexyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-hexyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-heptyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-heptyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-octyl-26,27-

cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-octyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-

1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-nonyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-nonyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-decyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-

1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-decyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24S)-25-ethylene-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

(5Z,7E,22E)-(1S,3R,24R)-25-ethylene-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-

tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24S)-25-(1-propenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24R)-25-(1-propenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24S)-25-(1-butenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24R)-25-(1-butenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24S)-25-(1-pentenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24R)-25-(1-pentenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24S)-25-(1-hexenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24R)-25-(1-hexenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24S)-25-(1-heptenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24R)-25-(1-heptenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24S)-25-(1-octenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24R)-25-(1-octenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24S)-25-(1-nonenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24R)-25-(1-nonenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24S)-25-(1-decenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(E)]-(1S,3R,24R)-25-(1-decenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24S)-25-(1-propenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24R)-25-(1-propenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24S)-25-(1-butenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24R)-25-(1-butenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24S)-25-(1-pentenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24R)-25-(1-pentenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24S)-25-(1-hexenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24R)-25-(1-hexenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24S)-25-(1-heptenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24R)-25-(1-heptenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24S)-25-(1-octenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24R)-25-(1-octenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24S)-25-(1-nonenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24R)-25-(1-nonenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

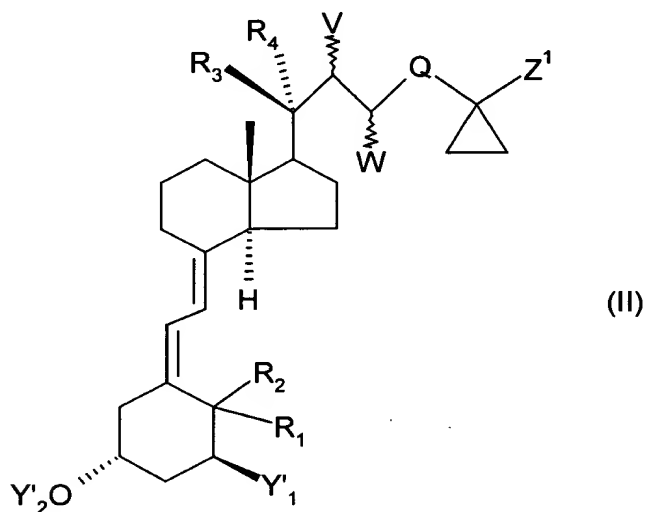
[5Z,7E,22E,25(Z)]-(1S,3R,24S)-25-(1-decenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol,

[5Z,7E,22E,25(Z)]-(1S,3R,24R)-25-(1-decenyl)-26,27-cyclo-9,10-secocholesta-

5,7,10(19),22-tetraene-1,3,24-triol.

6. A process for the production of compounds according to claim 1, comprising:
converting a compound of formula II



in which

Y'₁ means a hydrogen atom, a halogen atom, or a protected hydroxyl group and Y'₂ means a hydroxy protective group,

into a compound of formula I by simultaneous or successive cleavage of the hydroxy and keto protective groups and optionally by partial or complete esterification of free hydroxyl groups.

8. A method for treating a patient suffering from hyperproliferative diseases of the skin, pruritus, tumor diseases, precancerous stages, disorders of the immune system, inflammatory

diseases, rheumatoid arthritis, asthma, auto-immune diseases, multiple sclerosis, diabetes mellitus, AIDS, or rejection reactions associated with autologous, allogeneic or xenogeneic transplants comprising administering to said patient an effective amount of a compound according to claim 1.

9. A method according to claim 8, wherein said compound is administered in combination with other substances that have an immunosuppressive action.

10. A method for treating a patient suffering from secondary hyperparathyroidism, renal osteodystrophia, senile and postmenopausal osteoporosis, diabetes mellitus type II, or degenerative diseases of the peripheral and central nervous system comprising administering to said patient an effective amount of a compound according to claim 1.

11. A method for treating a patient suffering from hypercalcemias or granulomatous diseases, paraneoplastic hypercalcemias, hypercalcemia in the case of hyperparathyroidism, hirsutism, arteriosclerosis, or inflammatory diseases comprising administering to said patient an effective amount of a compound according to claim 1.

14. A pharmaceutical composition comprising a compound according to claim 1 and a pharmaceutically acceptable carrier.

15. A method according to claim 9, wherein said other substance is selected from cyclosporin A, FK 506, rapamycin and anti-CD 4 antibodies.

16. A method for regulating hair growth in a patient comprising administering to said patient an effective amount of a compound according to claim 1.

17. A method of providing birth control to a male or female patient comprising administering to said patient a compound according to claim 1.

18. A method of inducing an immunostimulant effect in a patient comprising administering to said patient a compound according to claim 1.

19. A vitamin D compound wherein said compound is:
(5Z, 7E, 22E)-(1S, 3R, 24S)-25-ethyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3-24-triol,

(5Z, 7E, 22E)-(1S, 3R, 24R)-25-ethyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 [5Z, 7E, 22E, 25(Z)]-(1S, 3R, 24S)-25-(1-butenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 [5Z, 7E, 22E, 25(E)]-(1S, 3R, 24S)-25-(1-butenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 [5Z, 7E, 22E, 25(E)]-(1S, 3R, 24R)-25-(1-butenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z, 7E, 22E)-(1S, 3R, 24S)-25-butyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z, 7E, 22E)-(1S, 3R, 24R)-25-butyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z, 7E, 22E)-(1S, 3R, 24S)-25-hexyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z, 7E, 22E)-(1S, 3R, 24R)-25-hexyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z, 7E, 22E)-(1S, 3R, 24S)-25-heptyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z, 7E, 22E)-(1S, 3R, 24R)-25-heptyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z, 7E, 22E)-(1S, 3R, 24S)-25-octyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 (5Z, 7E, 22E)-(1S, 3R, 24R)-25-octyl-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol,
 [5Z, 7E, 22E, 25(Z)]-(1S,3R,24S)-25-(1-octenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol, or
 [5Z, 7E, 22E, 25(Z)]-(1S,3R,24S)-25-(1-octenyl)-26,27-cyclo-9,10-secocholesta-5,7,10(19),22-tetraene-1,3,24-triol.

20. A compound according to claim 1, wherein R₁ and R₂ are each hydrogen.

21. A compound according to claim 1, wherein R₃ is H and R₄ is methyl, R₃ is methyl and R₄ is H, R₃ is F and R₄ is methyl, R₃ is methyl and R₄ is F, R₃ is methyl and R₄ is

methyl or R₃ and R₄, together form a methylene group, or R₃ and R₄ together with carbon atom 20 form a cyclopropyl ring.

22. A compound according to claim 1, wherein R₈ and R₉ are each independently methyl, ethyl, propyl, i-propyl, butyl or phenyl.

23. A compound according to claim 1, wherein Q is -CH₂-, -(CH₂)₂-, -(CH₂)₃-, -(CH₂)₄-, -(CH₂)₇-, -CH₂-C(CH₃)₂-CH₂-, -CH₂-CH(CH₃)-CH₂-CH(CH₃)-CH₂-, -CH₂-CH(OH)-, -CH₂-CH₂-CH(OH)-, -CH(OH)-CH₂-, -CH(OH)-CH₂-CH₂-, -CH₂-CH(OH)-CH₂-CH(OH)-CH₂-, -CH₂-CH(OH)-CH₂-, -CH₂-CH(OH)-CH₂-CH(OH)-CH₂-, -CH(OCH₃)-, -CH₂-CH(OC₂H₅)-, -CH₂-CH(OCOCH₃)-CH₂-CH(OCOCH₃)-CH₂-, -CH₂-CH(OCOC₄H₉)-CH₂-, -CO-CH₂-, -CO-CH₂-CH₂-, -CH₂COCH₂-, -CH(Cl)-, -CH(Cl)-CH₂-, -CH₂-CH(Cl)-, -CH(NH₂)-, -CH(NH₂)-CH₂-, -CH(N(CH₃)₂)-, -CH(N(CH₃)₂)-CH₂-, -CH₂-CH(N(CH₃)₂)-CH₂-CH(N(CH₃)₂)-CH₂-, -CH(F)-, -CH(F)-CH₂-, -CH₂-CH(F)-CH₂-.

24. A compound according to claim 1, wherein Q is an unsubstituted, unbranched alkylene with 1-3 carbon atoms, -CH(OH)-CH₂- or -CH(OH)-CH₂-CH₂-.

25. A compound according to claim 1, wherein Z is -CH₃, -CH₂-CH₃, -(CH₂)₂-CH₃, -(CH₂)₃-CH₃, -(CH₂)₄-CH₃, -(CH₂)₅-CH₃, -(CH₂)₆-CH₃, -(CH₂)₇-CH₃, -CH₂-C(CH₃)₂-CH₂-CH₃, -CH₂-CH(CH₃)-CH₂-CH(CH₃)-CH₂-CH₃, -CH(OH)-CH₃, -CH₂-CH(OH)-CH₃, -CH₂-CH(OH)-CH₂-CH(OH)-CH₂-CH₃, -CH(OCH₃)-CH₃, -CH₂-CH(OC₂H₅)-CH₃, -CH₂-CH(OCOCH₃)-CH₂-CH(OCOCH₃)-CH₂-CH₃, -CH₂-CH(OCOC₄H₉)-CH₂-CH₃, -CH₂COCH₂-CH₃, -CH₂-CH(Cl)-CH₃, -CH₂-CH(N(CH₃)₂)-CH₂-CH(N(CH₃)₂)-CH₂-CH₃, -CH₂-CH(F)-CH₂-CH₃.

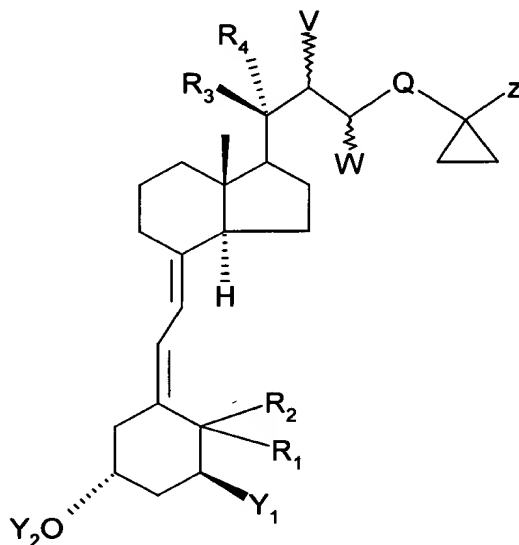
26. A compound according to claim 1, wherein Z is 1-oxoalkyl having 1-12 C atoms, alkyl having 1-12 C atoms or alkenyl having 1-12 C atoms.

27. A compound according to claim 1, wherein group V is a hydroxyl group and W is a hydrogen atom.

28. A compound according to claim 26, wherein Z is 1-oxopropyl, 1-oxobutyl, 1-oxopentyl, 1-oxohexyl, 1-oxoheptyl, 1-oxooctyl, 1-oxononyl, 1-oxodecyl, acetyl, methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, 1-propenyl, 1-butenyl, 1-pentenyl, 1-hexeynyl, 1-heptenyl, 1-octenyl, 1-nonenyl, 1-decenyl.

29. A method of preparing a pharmaceutical composition comprising combining a compound according to claim 1 with a pharmaceutically compatible vehicle.

30. A vitamin D compound of formula I,



in which

Y_1 means a hydrogen atom, a hydroxyl group, a fluorine, chlorine or bromine atom or a group $-OCOR_8$, in which

R_8 is an aliphatic or aromatic radical with 1 to 12 C atoms,

Y_2 means a hydrogen atom or a group $-(CO)R_9$, in which

R_9 is an aliphatic or aromatic radical with 1 to 12 C atoms,

R_1 and R_2 each mean a hydrogen atom or together an exocyclic methylene group,

R_3 and R_4 , independently of one another, mean a hydrogen atom, a chlorine or fluorine atom,

an alkyl group with 1 to 4 carbon atoms, or together form a methylene group or together with quaternary carbon atom 20 form a 3- to 7-membered, saturated or unsaturated carbocyclic ring,

V and W together mean an E-double bond or V means a hydroxyl group and W means a

hydrogen atom,

- Q means an unsubstituted, unbranched alkylene unit with 1 or 2 carbon atoms, and
- Z means a straight-chain or branched-chain, saturated or unsaturated hydrocarbon radical with up to 12 carbon atoms, which at any positions can have keto groups, - or -hydroxyl groups, which in turn can be etherified or esterified, amino groups, chlorine, or bromine atoms.